DOCUMENT RESUME

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ABSTRACT

As part of a series of tests to measure mastery of specific skills in the natural sciences, copies of tests 27 through 38 include: (27) reading a grid plan; (28) identifying common invertebrates; (29) characteristics of invertebrates; (30) identifying elements; (31) using scientific notation part I; (32) classifying minerals; (33) predicting the activity of metals; (34) interpreting ticker tapes; (35-36) predicting direction in a magnetic field 1 and 2; (37) dividing in scientific notation; and (38) using Ohm's law 2. The multiple choice questions were written for students in grades 7 to 10. Teachers' notes and scoring information are provided for each test. (CM)

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ED223623

M27

New South Wales **Department of Education**

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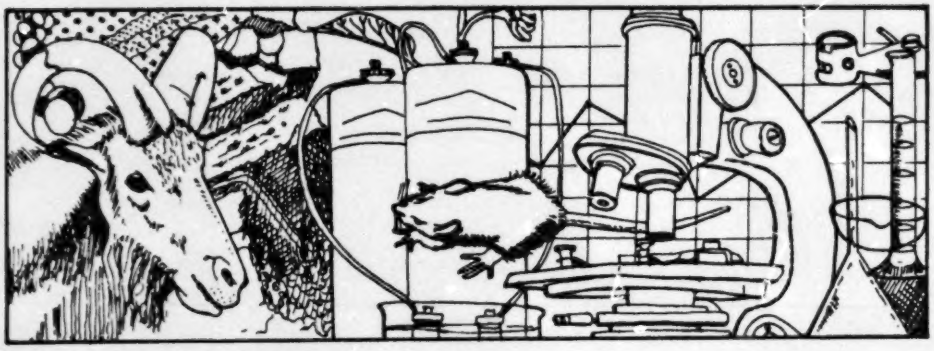
# SCIENCE

## MASTERY TESTING PROGRAMME



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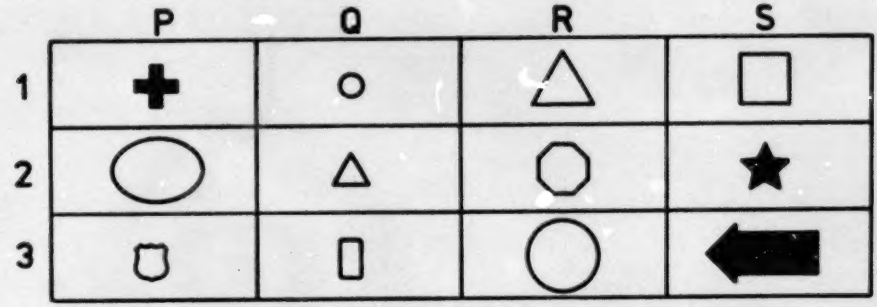
## TEST M27: A TEST FOR THE SKILL OF READING FROM A GRID PLAN

TM 820 3/1

This test is designed to test your ability to use a simple grid of the type found on many street maps, and in many of the tests in this series.

The first ten questions refer to this diagram.




Set 1

Find the grid square which contains the shape named, and work out its grid reference. Find the letter (A, B, C or D) which matches your answer, and mark it on your answer sheet.

| QUESTION | SHAPE | A | B | C | D |
|---|---|---|---|---|---|
| 1 | Star | P1 | Q3 | R1 | S2 |
| 2 | Rectangle | P2 | Q3 | R1 | S2 |
| 3 | Square | P3 | Q1 | R2 | S1 |
| 4 | Cross | P1 | Q2 | R3 | S1 |
| 5 | Large circle | P3 | Q2 | R3 | S3 |

Set 2

Look at the grid square named, and decide what the shape in that square is called. Find the letter (A, B, C or D) which matches that name, and mark it on your answer sheet.

| QUESTION | GRID SQUARE | A | B | C | D |
|---|---|---|---|---|---|
| 6 | P2 | ellipse | rectangle | square | triangle |
| 7 | Q3 | circle | rectangle | square | triangle |
| 8 | R1 | circle | ellipse | star | triangle |
| 9 | R3 | circle | rectangle | square | star |
| 10 | S2 | cross | octagon | star | triangle |

The next ten questions refer to this diagram.

| | T | U | V | W |
|---|---|---|---|---|
| 1 | 6 | 10 | 15 | 21 |
| 2 | 5 | 8 | 13 | 21 |
| 3 | 4 | 8 | 16 | 32 |

Set 3

Find the grid square which contains the number named, and work out its grid reference. Find the letter (A, B, C or D) which matches your answer, and mark it on your answer sheet.

| QUESTION | NUMBER | A | B | C | D |
|---|---|---|---|---|---|
| 11 | 6 | T1 | U2 | V2 | W2 |
| 12 | 16 | V1 | V3 | W2 | W3 |
| 13 | 13 | T2 | U3 | V2 | W1 |
| 14 | 10 | T3 | U1 | V1 | W3 |
| 15 | 15 | T1 | T3 | U2 | V1 |

Set 4

Find the two grid squares which are named, and add together the numbers in the two squares. Find the letter (A, B, C or D) which matches your answer and mark it on your answer sheet.

| QUESTION | SQUARES | A | B | C | D |
|---|---|---|---|---|---|
| 16 | T1 & U1 | 13 | 14 | 15 | 16 |
| 17 | T2 & V2 | 13 | 18 | 20 | 21 |
| 18 | U3 & W2 | 21 | 24 | 29 | 40 |
| 19 | T1 & W1 | 21 | 26 | 27 | 34 |
| 20 | T3 & W1 | 25 | 26 | 36 | 38 |

TEACHERS' NOTES

This test is designed to determine whether or not the student can use a simple grid plan.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | SCORE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥20 | ≥19 | ≥18 | ≥16 | ≥14 | ≥12 | ≥10 | ≥8 | <8 |
| 7 | 82 | 71% | 88% | 93% | 94% | 98% | 98% | 98% | 100% | - |
| 8 | 48 | 83% | 96% | 98% | 100% | 100% | 100% | 100% | 100% | - |

In general a student achieving a score of 16 out of 20 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores:

Low scores on certain sets of questions may indicate specific problems as indicated below:

Set 1: Lack of familiarity with names of shapes.

Set 2: Lack of familiarity with names of shapes.

Set 4: This set is more complex: "clerical" errors are more likely, as students are required to locate two grid squares and add the contents.

Related tests:

Many of the tests in the Mastery Testing Programme use diagrams with superimposed grids. This test is designed as a diagnostic tool to identify students whose problem is *not* failure to master the specified skill so much as difficulty in understanding the test format and/or context.

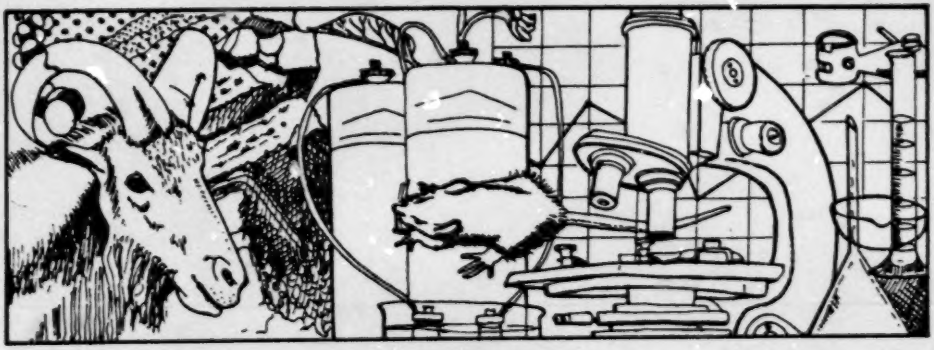
This test is thus primarily intended as a *diagnostic test* rather than as a test to allow certification of achievement. It would also be useful as a *readiness test*.

M28

New South Wales **Department of Education**

# SCIENCE

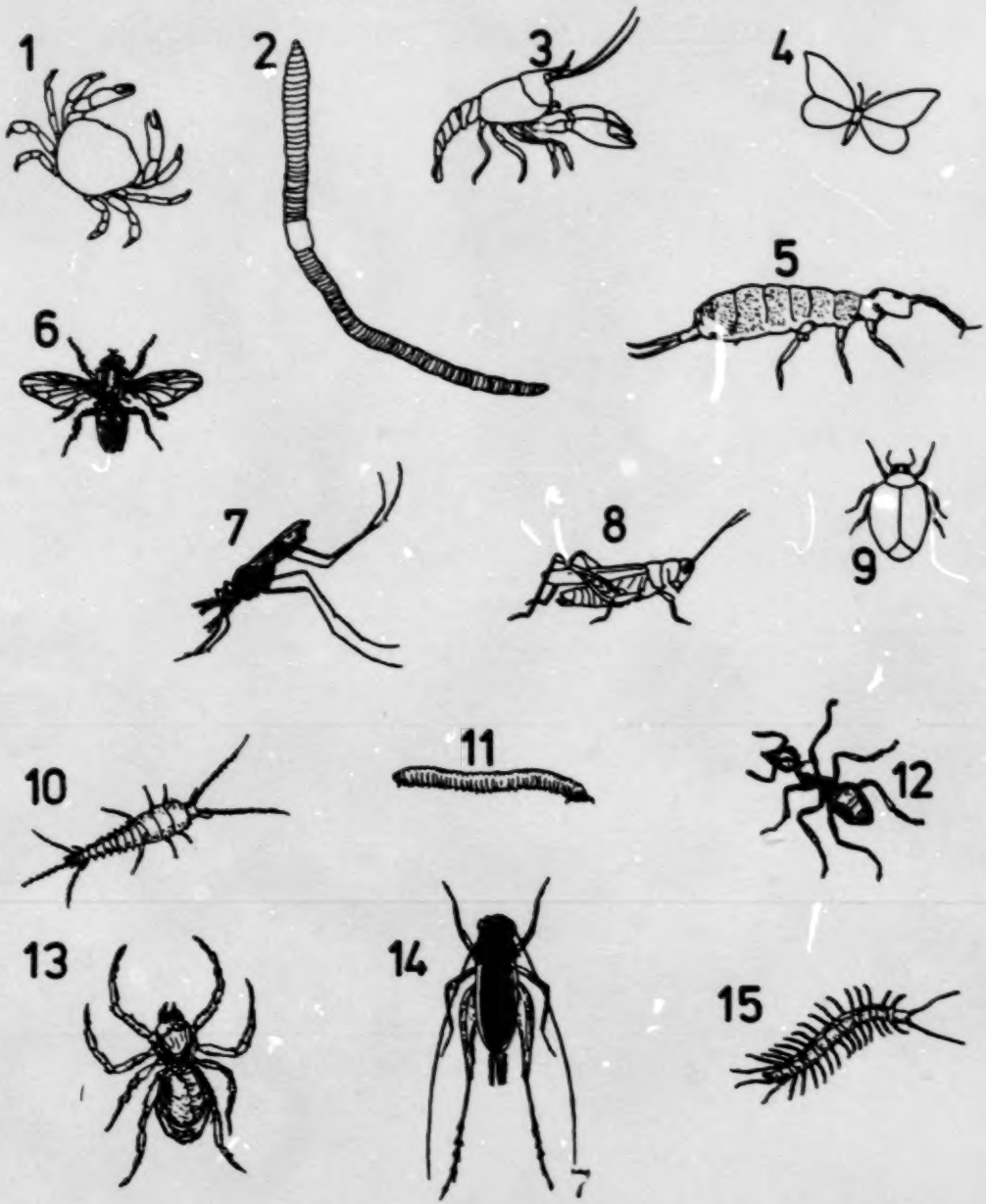
## MASTERY TESTING PROGRAMME



## TEST M28: A TEST FOR THE SKILL OF IDENTIFYING COMMON INVERTEBRATES

This test is designed to test your ability to identify common invertebrates (animals with no backbone). Look at the diagrams below, and then answer the questions opposite.

THESE ANIMALS ARE NOT DRAWN TO SCALE.



The questions on this page refer to the diagrams opposite. For each question, choose the drawing which matches the name. Mark your answer (A, B, C or D) on your answer sheet.

| QUESTION | ANIMAL | A | B | C | D |
|---|---|---|---|---|---|
| 1 | Centipede | 2 | 10 | 11 | 15 |
| 2 | Butterfly | 4 | 7 | 8 | 10 |
| 3 | Fly | 4 | 6 | 9 | 14 |
| 4 | Springtail | 3 | 5 | 8 | 10 |
| 5 | Worm | 2 | 10 | 11 | 15 |
| 6 | Beetle | 4 | 8 | 9 | 14 |
| 7 | Ant | 3 | 8 | 12 | 14 |
| 8 | Cricket | 3 | 7 | 8 | 14 |
| 9 | Mosquito | 4 | 7 | 8 | 14 |
| 10 | Crayfish | 1 | 3 | 5 | 10 |
| 11 | Millipede | 2 | 5 | 11 | 15 |
| 12 | Crab | 1 | 3 | 5 | 10 |
| 13 | Grasshopper | 3 | 7 | 8 | 14 |
| 14 | Silverfish | 8 | 9 | 10 | 15 |
| 15 | Spider | 9 | 12 | 13 | 14 |

TEACHERS' NOTES

This test is designed to determine whether or not the student can identify common representative invertebrates from drawings.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | S C O R E | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥15 | ≥ 14 | ≥ 13 | ≥ 12 | ≥11 | ≥10 | ≥ 8 | ≥ 6 | <6 |
| 7 | 48 | 71% | 79% | 88% | 100% | 100% | 100% | 100% | 100% | - |
| 8 | 61 | 62% | 75% | 87% | 92% | 95% | 97% | 97% | 98% | 2% |

In general a student achieving a score of 12 out of 15 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Related test: 021032 Recognising vertebrate classes.
021034 Naming common invertebrates.

Related skills for which tests have not been prepared:

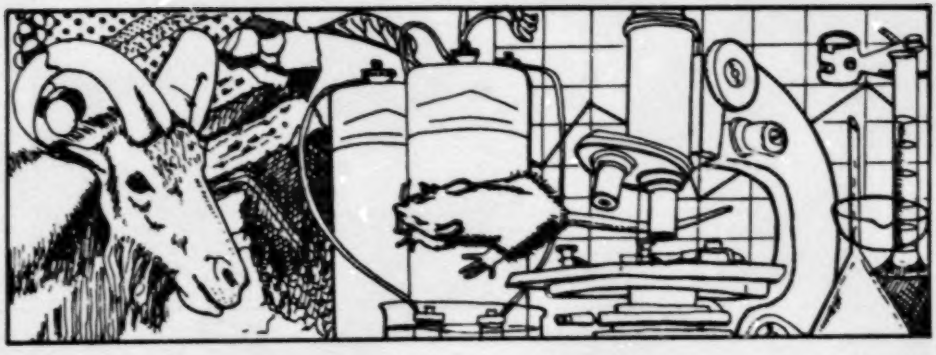
Identifying living specimens.

M29

New South Wales **Department of Education**

# SCIENCE

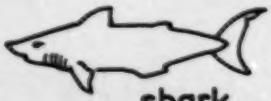
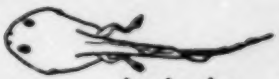
## MASTERY TESTING PROGRAMME



## TEST M29: A TEST FOR THE SKILL OF IDENTIFYING COMMON CHARACTERISTICS OF VERTEBRATES

This test is designed to measure your ability to identify the common characteristics of the groups of animals with backbones.

This table may help you to answer the questions on the opposite page correctly:

| ANIMAL GROUP | EXAMPLES |
|---|---|
| Fishes |  shark boney fish |
| Amphibians | frog  tadpole |
| Reptiles | tortoise lizard |
| Birds | heron penguin |
| Mammals | mouse bat |

In the questions opposite, decide which group (or groups) of animals fit the description. Find the letter (A, B, C or D) which matches your choice, and mark it on your answer sheet.

| QUESTION | CHARACTERISTICS | A | B | C | D |
|---|---|---|---|---|---|
| 1 | Warm-blooded | Amphibians & mammals | Birds & mammals | Amphibians birds & mammals | Birds, mammals & reptiles |
| 2 | Covered with fur | Amphibians | Birds | Fish | Mammals |
| 3 | Covered with dry scales | Amphibians | Fish | Mammals | Reptiles |
| 4 | Covered with slimy scales | Amphibians | Fish | Mammals | Reptiles |
| 5 | Naked skins | Amphibians | Fish | Mammals | Reptiles |
| 6 | Covered with feathers | Birds | Fish | Mammals | Reptiles |
| 7 | Bear young alive | Amphibians | Birds | Fish | Mammals |
| 8 | Lay eggs with hard shells | Amphibians | Birds | Fish | Reptiles |
| 9 | Lay eggs with leathery shells | Amphibians | Birds | Fish | Reptiles |
| 10 | Lay eggs with no shells | Amphibians & fish | Amphibians & reptiles | Fish & reptiles | Amphibians fish & reptiles |
| 11 | Have a four chambered heart | Amphibians & reptiles | Mammals & reptiles | Amphibians & birds | Birds, & mammals |
| 12 | Suckle their young | Amphibians | Birds | Mammals | Reptiles |
| 13 | Look after young | Amphibians & birds | Amphibians & fish | Amphibians, birds & mammals | Birds & mammals |
| 14 | Breathe with lungs at some stage in their life cycle | Amphibians, birds & mammals | Amphibians, birds, mammals & reptiles | Amphibians, mammals & reptiles | Birds, mammals & reptiles |
| 15 | Breathe with gills at some stage in their life cycle | Amphibians | Fish | Amphibians & fish | Amphibians fish & reptiles |
| 16 | Always have internal fertilisation | Amphibians, mammals & reptiles | Birds, mammals & fish | Birds, mammals & reptiles | Birds, fish, mammals & reptiles |
| 17 | Have a larval and an adult stage | Amphibians | Fish | Amphibians & fish | Reptiles |
| 18 | Have fins | Amphibians | Fish | Amphibians & fish | Amphibians, fish & birds |
| 19 | Have wings | Amphibians & fish | Birds & reptiles | Amphibians & birds | Birds & mammals |
| 20 | Have arms and legs | Amphibians & mammals | Birds & mammals | Birds, mammals & reptiles | Amphibians, birds, mammals & reptiles |

TEACHERS' NOTES

This test is designed to determine whether or not the student can identify the common characteristics of vertebrates.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teache. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | S C O R E | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ⩾19 | ⩾18 | ⩾17 | ⩾16 | ⩾15 | ⩾14 | ⩾12 | ⩾10 | <10 |
| 7 | 79 | 1% | 4% | 15% | 35% | 52% | 70% | 95% | 99% | 1% |
| 10 | 81 | 1% | 7% | 16% | 26% | 38% | 53% | 80% | 91% | 9% |

The most difficult items were 9, 11, 14, 15 and 19. Minor amendments have been made.

In general a student achieving a score of 16 out of 20 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Related tests:

| | |
|---|---|
| M2 | Using a biological key. |
| 021032 | Recognizing vertebrate classes. |
| 021033 | Identifying common arthropods. |
| 021034 | Naming common arthropods. |

Related skills for which tests have not been prepared:

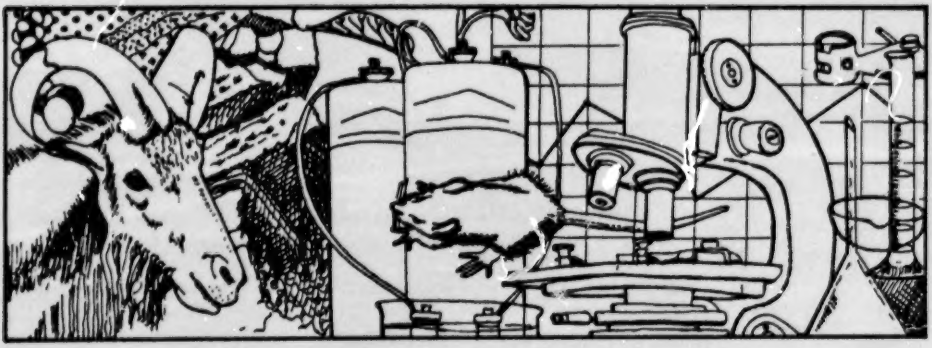
Identifying common vertebrates.

M30

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



## TEST M30: A TEST FOR THE SKILL OF IDENTIFYING ELEMENTS FROM DESCRIPTIONS

## PROPERTIES OF COMMON ELEMENTS

Choose the element which has the properties listed and mark its letter (A, B, C or D) on your answer sheet.

| QUESTION | CHARACTERISTICS AND PROPERTIES | ELEMENTS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | Colourless gas. Burns to form water. Lightest gas. | Oxygen | Hydrogen | Chlorine | Iodine |
| 2 | Colourless gas, relights a glowing splint, about 20% of the air. | Oxygen | Hydrogen | Nitrogen | Chlorine |
| 3 | Green-yellow gas, poisonous, bleaches objects. | Iodine | Nitrogen | Neon | Chlorine |
| 4 | Yellow solid, easily melted, burns with purple flame. | Magnesium | Copper | Sulfur | Chlorine |
| 5 | Colourless gas, does not burn, does not relight glowing splint. | Nitrogen | Hydrogen | Oxygen | Chlorine |
| 6 | Black solid, burns to form carbon dioxide. | Sulfur | Oxygen | Iodine | Carbon |
| 7 | Soft, dense metal easily melted, grey. | Lead | Sulfur | Iodine | Iron |
| 8 | The only metal which is liquid at room temperature. | Sodium | Bromine | Mercury | Oxygen |
| 9 | Hard grey metal, magnetic, rusts in moist air. | Magnesium | Iron | Copper | Zinc |
| 10 | Silvery metal used to galvanise iron. | Zinc | Silver | Lead | Sodium |
| 11 | Light metal, silvery, forms protective coating in air. Used in window frames. | Iron | Lead | Aluminium | Sodium |
| 12 | Fairly hard, light metal. Burns with brilliant flame. | Tin | Zinc | Aluminium | Magnesium |
| 13 | Very soft metal, reacts violently with water. | Tin | Iodine | Sulfur | Sodium |
| 14 | Dense shiny yellow metal. Precious, soft. | Sulfur | Gold | Iodine | Silver |
| 15 | Reddish metal, used to make fire hoods, water pipes, guttering, electric cables. | Silver | Gold | Copper | Aluminium |

Please note: the spelling "sulfur" has been used in this test to conform with international practice as established by the I.U.C.

TEACHERS' NOTES

This test is designed to determine whether or not the student can identify elements, given written descriptions.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | SCORE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 15 | ≥ 14 | ≥ 13 | ≥ 12 | ≥ 11 | ≥ 10 | ≥ 8 | ≥ 6 | <6 |
| 7 | 50 | 36% | 40% | 42% | 42% | 44% | 52% | 80% | 96% | 4% |
| 8 | 59 | 15% | 32% | 44% | 58% | 69% | 76% | 92% | 98% | 2% |

In general a student achieving a score of 12 out of 15 should be regarded as having mastered this skill. This score will need to be adjusted if the student has not encountered some of the elements named.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Related tests: M17 Identifying elements, mixtures and compounds.

Related skills for which tests have not been prepared:

Determining the properties of elements.

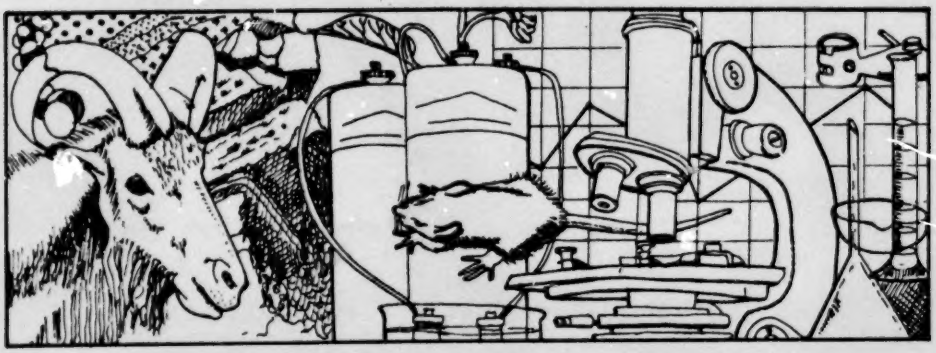
Identifying samples of elements.

M31

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



TEST M31: A TEST FOR

THE SKILL OF

USING SCIENTIFIC NOTATION PART I

This test is designed to measure your ability to express numbers in scientific notation as a power of ten.

## SET 1

Choose the correct answer and mark its letter (A, B, C or D) on your answer sheet.

| Question | Number | Possible answers in scientific notation | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | 100 | $10^0$ | $10^1$ | $10^2$ | $10^3$ |
| 2 | 1 000 | $10^2$ | $10^3$ | $10^4$ | $10^5$ |
| 3 | 1 | $10^0$ | $10^1$ | $10^2$ | $10^3$ |
| 4 | 40 | $4 \times 10^0$ | $4 \times 10^1$ | $4 \times 10^2$ | $4 \times 10^3$ |
| 5 | 60 000 | $6 \times 10^2$ | $6 \times 10^3$ | $6 \times 10^4$ | $6 \times 10^5$ |

## SET 2

Choose the correct answer and mark its letter (A, B, C or D) on your answer sheet.

| Question | Number | Possible Answers | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 6 | $2 \times 10^2$ | 2 | 20 | 200 | 2 000 |
| 7 | $3 \times 10^1$ | 3 | 30 | 300 | 3 000 |
| 8 | $4 \times 10^3$ | 4 | 40 | 400 | 4 000 |
| 9 | $8 \times 10^4$ | 800 | 8 000 | 80 000 | 800 000 |
| 10 | $7 \times 10^6$ | 70 | 700 | 70 000 | 7 000 000 |

## SET 3

Choose the correct answer and write this letter (A, B, C or D) on your answer sheet.

| Question Number | | Possible answer in scientific notation | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 11 | .1 | $1 \times 10^{1}$ | $1 \times 10^{0}$ | $1 \times 10^{-1}$ | $1 \times 10^{-2}$ |
| 12 | .22 | $22 \times 10^{0}$ | $2.2 \times 10^{0}$ | $22 \times 10^{-1}$ | $2.2 \times 10^{-1}$ |
| 13 | .01 | $1 \times 10^{-1}$ | $1 \times 10^{-2}$ | $1 \times 10^{-3}$ | $1 \times 10^{-4}$ |
| 14 | .004 | $4 \times 10^{-1}$ | $4 \times 10^{-2}$ | $4 \times 10^{-3}$ | $4 \times 10^{-4}$ |
| 15 | .036 | $36 \times 10^{-2}$ | $3.6 \times 10^{-2}$ | $3.6 \times 10^{-3}$ | $36 \times 10^{-4}$ |

## SET 4

Choose the correct answer and write this letter (A, B, C or D) on your answer sheet.

| Question Number | | Possible Answers | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 16 | $1 \times 10^{-1}$ | .1 | .01 | .001 | .0001 |
| 17 | $1.2 \times 10^{-2}$ | 1.2 | .12 | .012 | .0012 |
| 18 | $4.6 \times 10^{-4}$ | .46 | .046 | .0046 | .00046 |
| 19 | $5 \times 10^{-3}$ | .5 | .005 | .00005 | .000005 |
| 20 | $1.6 \times 10^{-1}$ | 1.6 | .16 | .016 | .0016 |

TEACHERS' NOTES

This test is designed tc determine whether or not the student can interpret numbers expressed in scientific notation.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schoo's.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher.

Only small samples were collected on this test. While they are sufficient to allow the test to be judged satisfactory, they would be misleading as a guide to standards. For this reason, the details are not supplied, but it should be noted that this is a hard test.

Related tests: M 24 Using Scientific Notation Part 2
M 37 Dividing Scientific Notation

Related skills for which tests have not been prepared:

Multiplying in Scientific Notation.

The Use of This Test

This test is mainly intended as a *readiness test*. As such it would be used *before* a unit of work which required these operations. In such a case, a non-mastery score indicates a need for specific remedial help.

The test is also intended for use at the end of a unit of work which aims to develop these skills either alone, or with others. Once again, non-mastery scores suggest a need for remedial help.

M32

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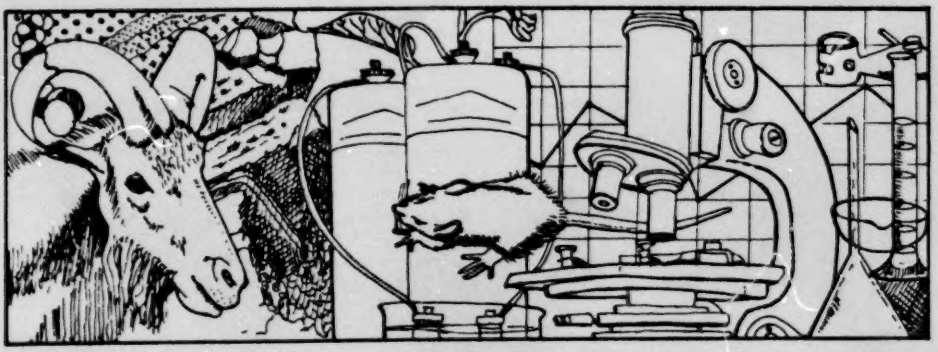
# SCIENCE

## MASTERY TESTING PROGRAMME



## TEST M32: A TEST FOR THE SKILL OF CLASSIFYING MINERALS

This test is designed to measure your ability to classify minerals. The minerals named in sets 1 and 2 do not exist. Those in set 3 do exist.

Set 1 Four minerals showed the following results.

| MINERAL | WAS SCRATCHED BY | WHEN FRESHLY BROKEN SHOWED | POWDERED COLOUR | LUSTRE |
|---|---|---|---|---|
| Finite | steel knife | no smooth surfaces | white | pearly |
| Golite | fingernail | 2 smooth surfaces | brown | metallic |
| Hilite | piece of broken glass | 1 smooth surface | white | dull |
| Jellite | copper coin | 3 smooth surfaces | white | glassy |

In each of the next five questions use the table above to choose the material which fits the description and mark its letter (A, B, C or D) on your answer sheet.

| QUESTION | DESCRIPTION THE MINERAL THAT | MINERALS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | has the greatest hardness | finite | golite | hilite | jellite |
| 2 | does not reflect light | finite | golite | hilite | jellite |
| 3 | has no cleavage | finite | golite | hilite | jellite |
| 4 | has a dark streak | finite | golite | hilite | jellite |
| 5 | has the most cleavages | finite | golite | hilite | jellite |

Set 2 In the table below are the properties of several minerals.

| MINERAL | HARDNESS | CLEAVAGE | FRACTURE | STREAK | COLOUR | LUSTRE |
|---|---|---|---|---|---|---|
| Nonite | 5 | 2 at $90^0$ | none | brown | pink | pearly |
| Pongite | 7 | none | conchoidal | white | clear | glassy |
| Quintite | 6 | none | none | white | grey | metallic |
| Respite | 5 | 2 at $60^0$ | none | brown | black | dull |
| Singlite | 2 | 3 at $90^0$ | none | white | white | pearly |
| Toonite | 4 | none | none | white | white | glassy |
| Violite | 5 | 2 at $60^0$ | none | black | black | dull |

In each of the next five questions, two minerals are named. Using the table above choose the *property* you would use to find out whether a mineral is one or the other. Mark the letter (A, B, C or D) of the property on your answer sheet.

| QUESTION | MINERALS | PROPERTY | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 6 | Nonite & Respite | hardness | cleavage | fracture | streak |
| 7 | Singlite & Toonite | hardness | fracture | streak | colour |
| 8 | Pongite & Toonite | cleavage | fracture | streak | lustre |
| 9 | Respite & Violite | hardness | cleavage | streak | colour |
| 10 | Quintite & Toonite | hardness | cleavage | fracture | streak |

Set 3 In the next five questions, two properties are given. Choose the mineral which has those properties and mark its letter (A, B, C or D) on your answer sheet.

| QUESTION | MINERAL PROPERTIES | A | B | C | D |
|---|---|---|---|---|---|
| 11 | Hardness = 7, conchoidal fracture | mica | feldspar | calcite | quartz |
| 12 | Hardness = 3, 3 cleavage planes | haematite | calcite | quartz | magnetite |
| 13 | Hardness = 2, 1 cleavage plane | calcite | quartz | feldspar | mica |
| 14 | Hardness = 5.5, magnetic | haematite | calcite | magnetite | mica |
| 15 | Hardness = 6, 2 cleavage planes | feldspar | haematite | calcite | quartz |

TEACHERS' NOTES

This test is designed to determine whether or not the student can use descriptions of mineral properties to identify minerals.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | SCORE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 15 | ≥ 14 | ≥ 13 | ≥ 12 | ≥ 11 | ≥ 10 | ≥ 9 | ≥ 8 | > <8 |
| 9 | 30* | 10% | 33% | 47% | 67% | 80% | 93% | 93% | 100% | - |
| 10 | 31* | 6% | 13% | 32% | 42% | 71% | 84% | 90% | 97% | 3% |

*Other smaller samples give similar results.

In general a student achieving a score of 12 out of 15 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores:

Low scores on certain sets of questions may indicate specific problems as indicated below:

Set 1: Difficulty in using a table of information (See M1, M23).

Set 2: Difficulty in using a table of information (See M1, M23).

Set 3: Unfamiliarity with mineral or properties named.

Related skills for which tests have not been prepared:

Determining properties of minerals.

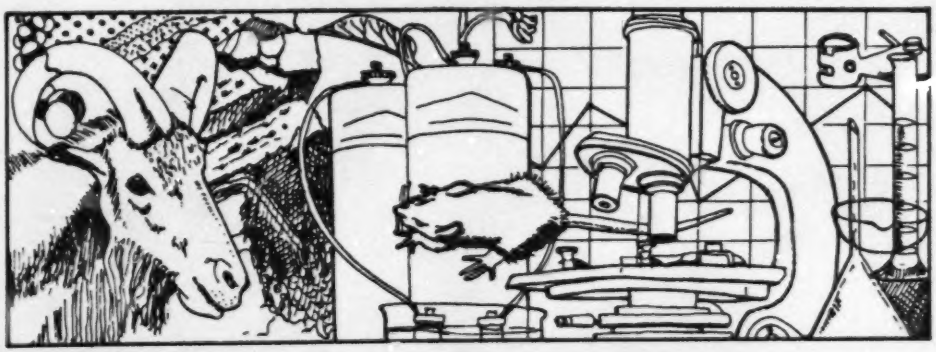
Identifying real minerals.

M33

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



## TEST M33: A TEST FOR

## THE SKILL OF

## APPLYING THE ACTIVITY SERIES OF METALS

This test requires prior knowledge of the 'activity series of metals' or access to an 'activity series of metals' chart.

The test is designed to measure your ability to make predictions about the relative activity of metals.

## SET 1

Choose the metal in each group that is the most active and mark its letter (A, B, C or D) on your answer sheet.

| Question | A | B | C | D |
|---|---|---|---|---|
| 1 | copper | sodium | zinc | iron |
| 2 | potassium | mercury | silver | aluminium |
| 3 | magnesium | copper | lead | calcium |
| 4 | barium | aluminium | copper | gold |
| 5 | lead | zinc | iron | platinum |

## SET 2

In each line of the table there are four metals, which should be in order from most active to least active. *However, one metal in each group is out of order.*

Choose the letter A, B, C or D which corresponds to the metal that is out of order and mark this letter on your answer sheet.

| Question | MOST ACTIVE → LEAST ACTIVE | | | |
|---|---|---|---|---|
| | A | B | C | D |
| 6 | aluminium | iron | sodium | copper |
| 7 | potassium | iron | lead | magnesium |
| 8 | magnesium | zinc | lead | calcium |
| 9 | mercury | sodium | barium | silver |
| 10 | copper | platinum | mercury | silver |

## SET 3

In each line of the table, *one metal will be displaced from the solution of its salt* by the metal given in column 1.

Choose the correct solution from which the metal will be displaced and mark its letter (A, B, C or D) on your answer sheet.

| Question | Column 1 | A | B | C | D |
|---|---|---|---|---|---|
| 11 | iron | sodium nitrate | magnesium nitrate | lead nitrate | calcium nitrate |
| 12 | lead | copper nitrate | aluminium nitrate | potassium nitrate | zinc nitrate |
| 13 | copper | iron nitrate | mercury nitrate | lead nitrate | potassium nitrate |
| 14 | zinc | silver nitrate | barium nitrate | calcium nitrate | sodium nitrate |
| 15 | magnesium | barium nitrate | potassium nitrate | sodium nitrate | zinc nitrate |

## SET 4

In each of the following questions, there are four metals arranged in different orders.

Choose the group of metals which is in the correct order *from least active to most active* and mark its letter (A, B, C or D) on your answer sheet.

| Question | A | B | C | D |
|---|---|---|---|---|
| 16 | gold<br>mercury<br>copper<br>lead | copper<br>gold<br>mercury<br>lead | lead<br>mercury<br>copper<br>gold | mercury<br>gold<br>copper<br>lead |
| 17 | barium<br>calcium<br>potassium<br>sodium | sodium<br>potassium<br>calcium<br>barium | potassium<br>sodium<br>barium<br>calcium | calcium<br>barium<br>sodium<br>potassium |
| 18 | iron<br>aluminium<br>magnesium<br>silver | silver<br>iron<br>aluminium<br>magnesium | aluminium<br>iron<br>magnesium<br>silver | magnesium<br>silver<br>iron<br>aluminium |
| 19 | platinum<br>copper<br>calcium<br>sodium | copper<br>platinum<br>sodium<br>calcium | calcium<br>copper<br>platinum<br>sodium | sodium<br>copper<br>platinum<br>calcium |
| 20 | barium<br>iron<br>lead<br>zinc | iron<br>zinc<br>lead<br>barium | lead<br>iron<br>zinc<br>barium | zinc<br>lead<br>barium<br>iron |

TEACHERS' NOTES

This test is designed to determine whether or not the student can apply the activity series of metals.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | SCORE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 20* | ≥ 19 | ≥ 18 | ≥ 17 | ≥ 16 | ≥ 14 | ≥ 12 | ≥ 10 | <10 |
| 9 | 50 | 30% | 56% | 64% | 66% | 74% | 94% | 96% | 98% | 2% |
| 10 | 58 | 3% | 5% | 9% | 10% | 17% | 29% | 57% | 72% | 28% |

*In trials, question 20 had no correct answer. This has been allowed for in these figures.

In general a student achieving a score of 16 out of 20 should be regarded as having mastered this skill. This score may need to be modified if students do not have access to an activity series table.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores:

Low scores on certain sets of questions may indicate specific problems as indicated below:

Sets 1 and 2: Inability to apply the order of the activity series of metals.

Set 3: Lack of understanding of the concept of displacement of metals.

Set 4: Inability to apply the order of the activity series of metals.
Inability to comprehend varying orders of metals.

Related skills for which tests have not been prepared:

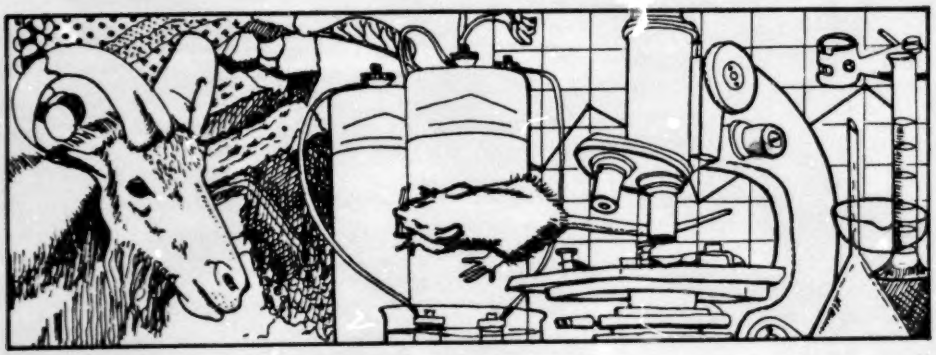
Determining the activity series of metals.

M34

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



## TEST M34: A TEST FOR

## THE SKILL OF

## INTERPRETING TICKER TAPES

This test is designed to test your ability to interpret tapes which have passed through a "ticker timer".

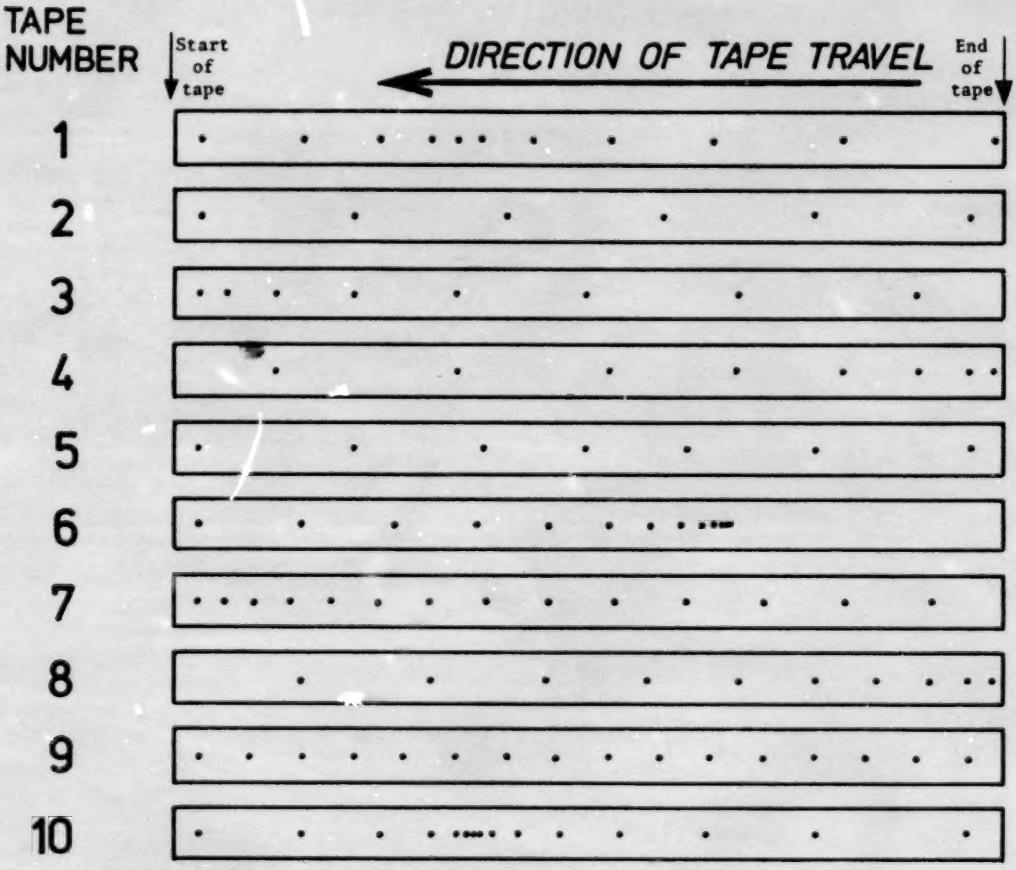
For each question mark your answer sheet like this:

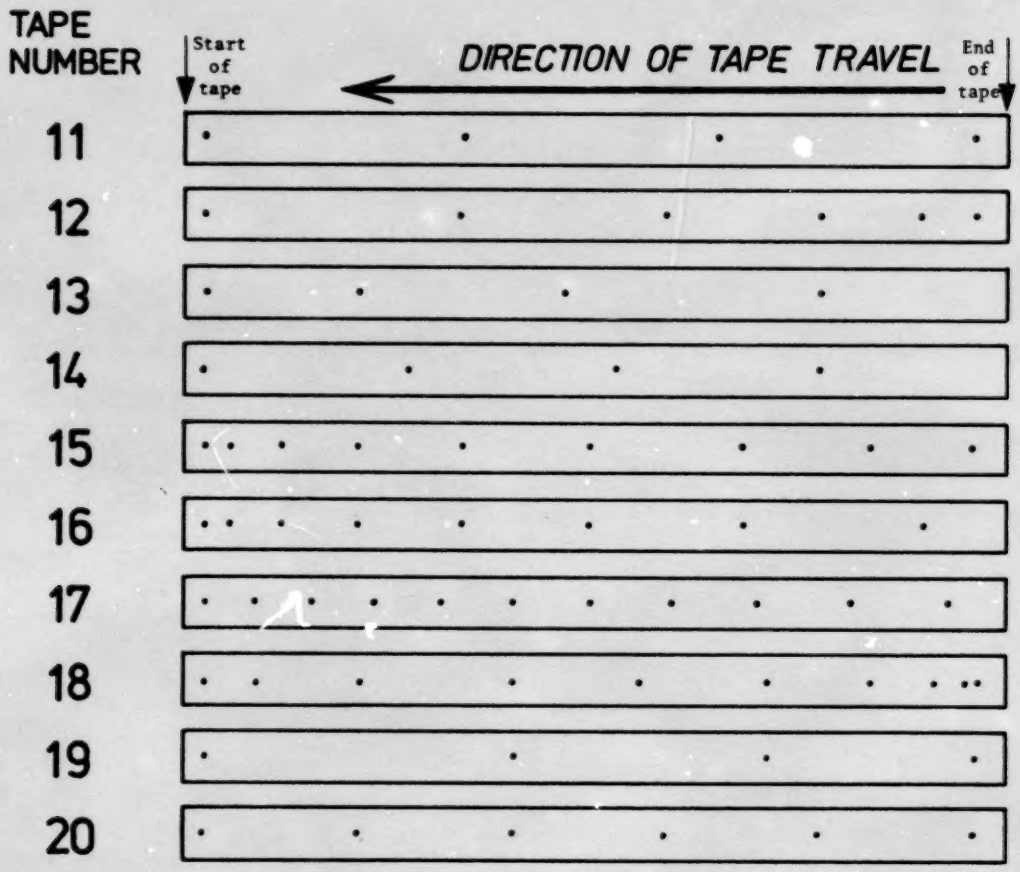
"A": The tape accelerated all through the measurement time.

"B": The tape both accelerated and decelerated all through the measurement time.

"C": The tape moved at constant speed all through the measurement time.

"D": The tape decelerated all through the measurement time.




TAPE NUMBER
Start of tape
DIRECTION OF TAPE TRAVEL
End of tape
11
12
13
14
15
16
17
18
19
20

TEACHERS' NOTES

This test is designed to determine whether or not the student can interpret acceleration and deceleration from "ticker timer" tapes.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | S C O R E | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 20 | ≥ 19 | ≥ 18 | ≥ 16 | ≥ 14 | ≥ 12 | ≥ 10* | ≥ 8 | <8 |
| 9 | 33 | 15% | 39% | 48% | 55% | 55% | 58% | 76% | 100% | - |
| 10 | 95 | 15% | 19% | 23% | 24% | 25% | 32% | 66% | 99% | 1% |

*This is due to students confusing acceleration and deceleration. The instructions have been amended to avoid this.

In general a student achieving a score of 16 out of 20 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores: This test has not been divided into sets. The following points may be of some assistance:

Students who miss "A" responses: these students may be confused about the meaning of "acceleration", or the correct way to interpret "tape direction". Look at the "D" responses.

Students who miss "B" responses: these students may not understand what the diagrams represent, or they may have failed to use a ruler to measure distances between dots.

Students who miss "C" responses: as for B.

Students who miss "D" responses: these students may be confused about the meaning of "deceleration", or the correct way to interpret "tape direction". Look at the "A" responses.

Related tests: 021045 Calculating from ticker tapes.

Related skills for which tests have not been prepared:

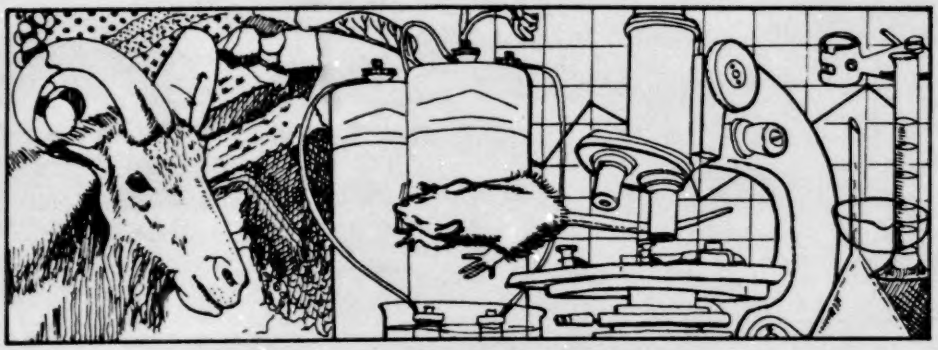
Making records using ticker timers.

M35

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



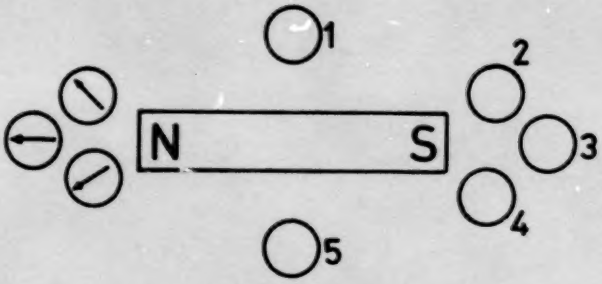
## TEST M35: A TEST FOR THE SKILL OF PREDICTING THE DIRECTION OF A MAGNETIC FIELD 1

This test is designed to measure your ability to predict the direction of a compass needle in the region around a magnet.

In each of the following questions, 8 magnetic compasses are placed around a magnet as shown.

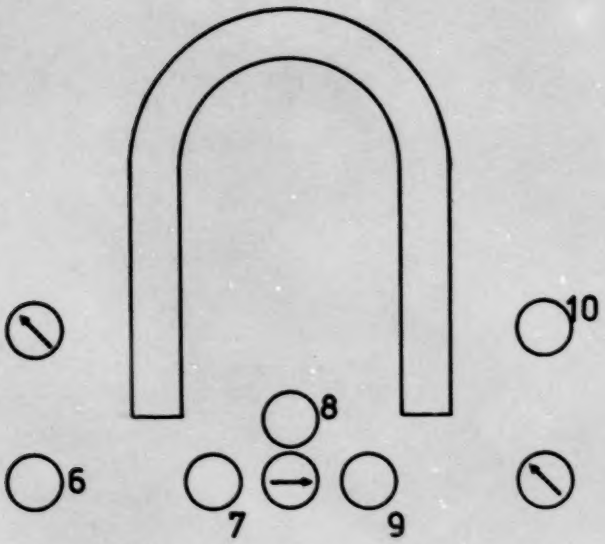
Choose the correct direction in which each numbered compass needle would point and mark the letter (A, B, C or D) on your answer sheet.

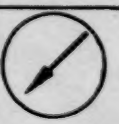
## Set 1.




| QUESTION | COMPASS | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | 1 | | | | |
| 2 | 2 | | | | |
| 3 | 3 | | | | |
| 4 | 4 | | | | |
| 5 | 5 | | | | |

## Set 2




| QUESTION | COMPASS | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 6 | 6 | | | | |
| 7 | 7 | | | | |
| 8 | 8 | | | | |
| 9 | 9 | | | |  |
| 10 | 10 | | | | |

TEACHERS' NOTES

This test is designed to determine whether or not the student can estimate the direction of a magnetic field.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. Trials of this test were affected by lack of correct answers on two questions, and the small members taking the test in each year.

As a result, figures will not be supplied on this test, but teachers are assured that the faults have been removed.

In general, any student scoring 8 out of 10 on this difficult test should be regarded as having mastered the skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores:

Low scores on certain sets of questions may indicate specific problems as indicated below:

Unfamiliarity with conventions of representation.

Unfamiliarity with this situation.

Related skills for which tests have not been prepared:

Using compasses.

Making compasses.

Related tests:

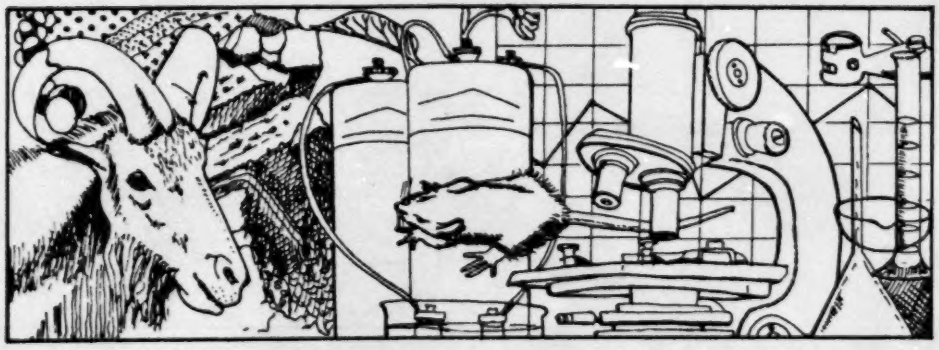
M36 - Predicting the direction of a magnetic field 2.

M36

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



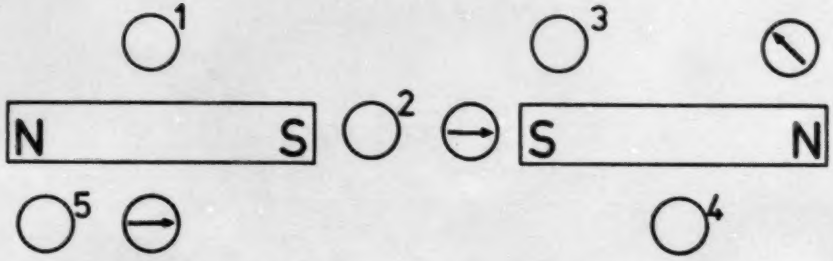
## TEST M36: A TEST FOR THE SKILL OF PREDICTING THE DIRECTION OF A MAGNETIC FIELD 2

This test is designed to measure your ability to predict the direction of a compass needle in the region around a magnet.

In each of the following questions, 8 magnetic compasses are placed around two magnets as shown.

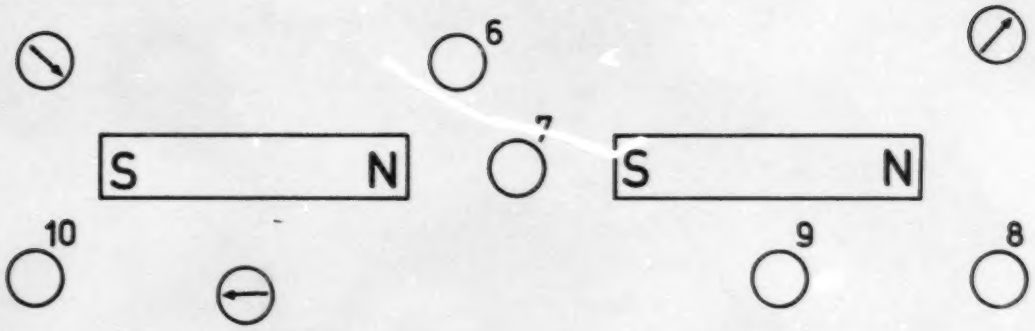
Choose the correct direction in which each numbered compass needle would point and mark the letter (A, B, C or D) on your answer sheet.

## Set 1




| QUESTION | COMPASS | A N S W E R S<br>A | B | C | D |
|---|---|---|---|---|---|
| 1 | 1 | | | | |
| 2 | 2 | | | | |
| 3 | 3 | | | | |
| 4 | 4 | | | | |
| 5 | 5 | | | | |

## Set 2




| QUESTION | COMPASS | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 6 | 6 | | | | |
| 7 | 7 | | | | |
| 8 | 8 | | | | |
| 9 | 9 | | | | |
| 10 | 10 | | | | |

TEACHERS' NOTES

This test is designed to determine whether or not the student can predict the direction of a magnetic field.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. Trials of this test were affected by lack of correct answers on two questions, and the small members taking the test in each year.

As a result, figures will not be supplied on this test, but teachers are assured that the faults have been removed.

In general, any student scoring 8 out of 10 on this difficult test should be regarded as having mastered the skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set scores:

Low scores may indicate specific problems as indicated below:

Unfamiliarity with conventions of representation.

Unfamiliarity with this situation.

Related skills for which tests have not been prepared:

Using compasses.

Making compasses.

Related tests:

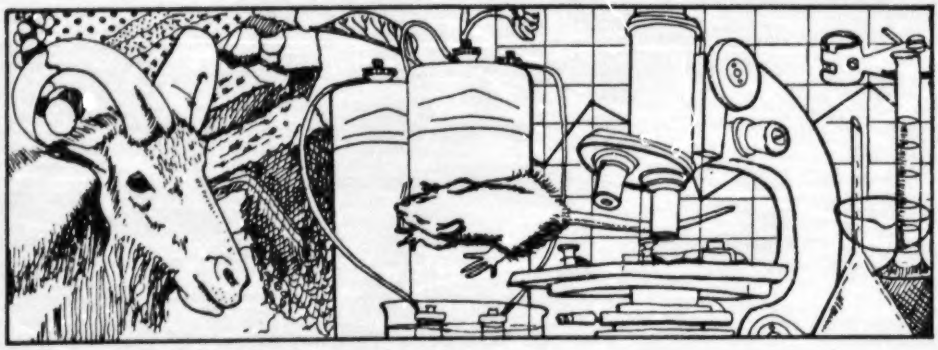
M35 - Predicting the direction of a magnetic field 1.

M37

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



## TEST M37: A TEST FOR THE SKILL OF DIVIDING IN SCIENTIFIC NOTATION

This test is designed to test your ab[illegible] to make calculations by dividing numbers which are written in powers of 10.

For each question select the alterrative which is the correct answer. Write the letter of your choice (A, B, C or D) on your answer sheet.

Set 1

| QUESTION | PROBLEM | A | B | C | D |
|---|---|---|---|---|---|
| 1 | $10^5 \div 10^2$ | 2.5 | $10^2$ | $10^{2.5}$ | $10^3$ |
| 2 | $10^5 \div 10^4$ | 1 | 10 | $10^{\frac{5}{4}}$ | $10^9$ |
| 3 | $10^6 \div 10^3$ | 2 | $10^{\frac{1}{2}}$ | $10^9$ | $10^3$ |
| 4 | $10^9 \div 10^9$ | 1 | $10^1$ | $10^{18}$ | $10^{81}$ |
| 5 | $10^9 \div 10^3$ | $10^3$ | $10^6$ | $10^{12}$ | $10^{27}$ |

Set 2

| QUESTION | PROBLEM | A | B | C | D |
|---|---|---|---|---|---|
| 6 | $10^2 \div 10^3$ | $10^5$ | $10^1$ | 1 | $10^{-1}$ |
| 7 | $10^3 \div 10^{-2}$ | $10^{-1}$ | $10^1$ | $10^5$ | $10^{-5}$ |
| 8 | $10^{-4} \div 10^2$ | - 2 | $10^{-2}$ | $10^2$ | $10^{-6}$ |
| 9 | $10^{-1} \div 10^{-2}$ | - 3 | 1 | $10^1$ | $10^{-3}$ |
| 10 | $10^{-4} \div 10^{-2}$ | - 2 | - 6 | $10^{-2}$ | $10^{-6}$ |

Set 3

| QUESTION | PROBLEM | A | B | C | D |
|---|---|---|---|---|---|
| 11 | $4 \times 10^{2} \div 2 \times 10^{1}$ | $2 \times 10^{1}$ | $2 \times 10^{3}$ | $9 \times 10^{1}$ | $6 \times 10^{3}$ |
| 12 | $6 \times 10^{4} \div 3 \times 10^{2}$ | 2 | $2 \times 10^{2}$ | $2 \times 10^{4}$ | $3 \times 10^{6}$ |
| 13 | $8 \times 10^{5} \div 2 \times 10^{1}$ | 40 | $16 \times 10^{6}$ | $4 \times 10^{3}$ | $4 \times 10^{4}$ |
| 14 | $9 \times 10^{10} \div 3 \times 10^{5}$ | 6 | $3 \times 10^{2}$ | $6 \times 10^{5}$ | $3 \times 10^{5}$ |
| 15 | $15 \times 10^{5} \div 3 \times 10^{5}$ | 5 | $12 \times 10^{0}$ | $5 \times 10^{5}$ | $5 \times 10^{10}$ |

Set 4

| QUESTION | PROBLEM | A | B | C | D |
|---|---|---|---|---|---|
| 16 | $6 \times 10^{2} \div 3 \times 10^{4}$ | $2 \times 10^{-2}$ | $2 \times 10^{2}$ | $2 \times 10^{6}$ | $2 \times 10^{8}$ |
| 17 | $8 \times 10^{6} \div 4 \times 10^{-2}$ | $2 \times 10^{-3}$ | $2 \times 10^{4}$ | $2 \times 10^{6}$ | $2 \times 10^{8}$ |
| 18 | $6 \times 10^{-4} \div 2 \times 10^{-2}$ | $4 \times 10^{-6}$ | $3 \times 10^{-4}$ | $3 \times 10^{-2}$ | $3 \times 10^{2}$ |
| 19 | $4 \times 10^{-2} \div 2 \times 10^{-1}$ | $2 \times 10^{-1}$ | $2 \times 10^{-3}$ | $2 \times 10^{1}$ | 2 |
| 20 | $5 \times 10^{-10} \div 5 \times 10^{-5}$ | $10^{-2}$ | 2 | $10^{-5}$ | $10^{-15}$ |

TEACHERS' NOTES

This test is designed to determine whether or not the student can divide when both numerator and demoninator are expressed in scientific notation.

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the longest samples occur.

| YEAR | NO. OF STUDENTS | S C O R E | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 20 | ≥19 | ≥18 | ≥17 | ≥16 | ≥14 | ≥ 12 | ≥10 | <10 |
| | | ONLY ONE YEAR TOOK PART IN THESE TRIALS | | | | | | | | |
| 10 | 147 | 29% | 41% | 48% | 52% | 57% | 68% | 76% | 86% | 14% |

In general a student achieving a score of 16 out of 20 should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Set Scores: Each set is progressively harder, and calls for higher-order skills than the preceding sets. Problems with a particular subskill and/or item type will be apparent from the set scores. This test is mainly intended as a *readiness test*, and it may be that only one set need be administered at a given time.

Related tests M31 Using scientific notation 1
M24 Using scientific notation 2

Related skills for which tests have not been prepared:

Multiplying in scientific notation

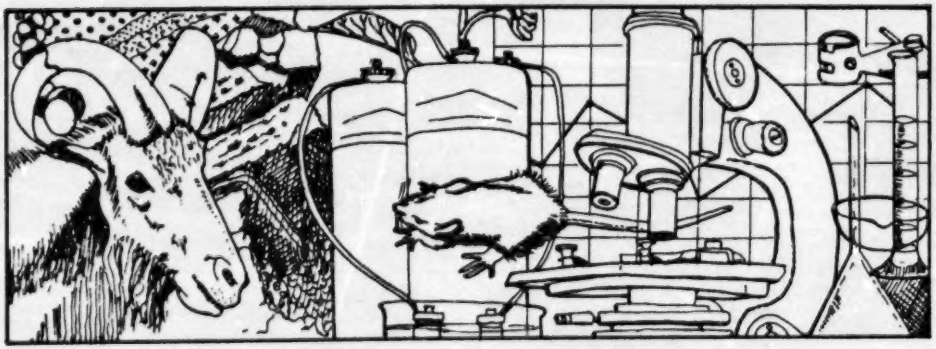
Converting to and from scientific notation.

M38

New South Wales **Department of Education**

# SCIENCE

## MASTERY TESTING PROGRAMME



TEST M38: A TEST FOR

THE SKILL OF

USING OHM'S LAW 2

This test is designed to test your ability to understand and use Ohm's Law.

Set 1

In the next ten questions, you will find incomplete statements about Ohm's Law. Choose the word or phrase which best completes the statement. Mark its letter (A, B, C or D) on your answer sheet.

| QUESTION | STATEMENT | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | The equation representing Ohm's Law is:- | I = VR | V = IR | V = I + R | R = IV |
| 2 | In the equation representing Ohm's Law, V represents:- | Volume | Voltage | Velocity | Current |
| 3 | In the equation representing Ohm's Law, I represents:- | Input | Iron | Current | Copper |
| 4 | In the equation representing Ohm's Law, R represents:- | Radius | Resistance | Current | Voltage |
| 5 | In Ohm's Law, V is measured in:- | Amps | Ohms | Volts | Watts |
| 6 | In Ohm's Law, I is measured in:- | Joules | Amps | Ohms | Watts |
| 7 | In Ohm's Law, R is measured in:- | Ohms | Volts | Amps | Newtons |
| 8 | If the voltage is doubled in a given electrical circuit, the | current will be doubled | current will be halved | resistance will be doubled | resistance will be halved |
| 9 | If the voltage is constant, then to double the current in a circuit, the resistance must be | doubled | halved | kept the same | zero |

Set 1 (Continued)

| QUESTION | STATEMENT | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 10 | If the current is to be kept constant, then if the resistance is halved, the potential difference must be | doubled | halved | kept the same | zero |

Set 2

In the next five questions, you will find incomplete statements about the quantities used in Ohm's Law. Choose the word or phrase which best completes the statement. Mark its letter (A, B, C or D) on your answer sheet.

| QUESTION | STATEMENT | ANSWERS | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 11 | Potential Difference (P.D.) is the same as:- | Current | Voltage | Resistance | Power |
| 12 | The voltage is measured using:- | an ammeter | a galvanometer | a voltmeter | a barometer |
| 13 | The current is measured using:- | an ammeter | a thermometer | a voltmeter | a barometer |
| 14 | Resistance can be considered as:- | charge on the move | thickness of a wire | field of a magnet | opposition to electrical flow |
| 15 | Current can be considered as:- | electrical pressure | current flowing | electrons flowing | atoms moving |

TEACHERS' NOTES

This test is designed to determine whether or not the student can understand and use Ohm's Law (as opposed to rote application of the equation).

This test has been tested on a range of students in Years 7 to 10 in New South Wales schools.

Recommended mastery score:

The final decision as to the score which indicates mastery must lie with the classroom teacher. The information below will help you to arrive at an informed decision. In this table you will find the percentages of students achieving a given score *or better*. Cumulative percentages are given for the two years in which the largest samples occur.

| YEAR | NO. OF STUDENTS | S C O R E | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≥ 15 | ≥ 14 | ≥ 13 | ≥ 12 | ≥ 11 | ≥10 | ≥9 | ≥8 | <8 |
| 8 | 54* | 4 | 11 | 17 | 46 | 70 | 78 | 93 | 96 | 4 |
| 10 | 95* | 1 | 3 | 10 | 26 | 43 | 63 | 74 | 87 | 13 |

* These samples are too small to allow any valid conclusions. The total sample was of the order of 200 students.

In general a student achieving a score of out of should be regarded as having mastered this skill.

Proper use of the scores:

This test is not designed to rank or grade students and its use for this purpose is highly undesirable. The scores obtained on this test will supply information about students who are having difficulty with the skill tested. For a more detailed analysis of these points, consult the manual which accompanies these tests.

Related tests:

M18 - Using Ohm's Law

Related skills for which tests have not been prepared:

Measuring potential difference.

Measuring current.

Measuring resistance.

Connecting circuits.